***Choropleth Map: Speculate the rest of the trend/pattern***

**Portal: Patterns and Trends**

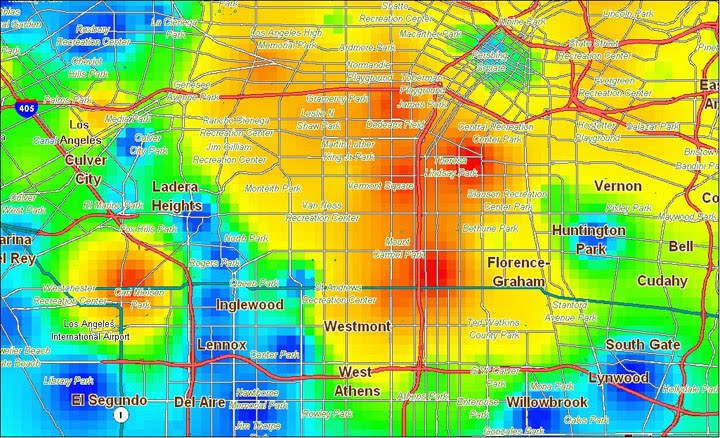
**Critical Challenge**

Critical Tasks

Interpret given data and speculate on continued patterns and trends

Overview

Students are provided with a world choropleth map where part of the map is concealed. Students will analyse the visible part of the map and then speculate on how the pattern continues into the concealed area. In addition they will identify any visible anomalies and speculate on any that may exist on the concealed part of the map

NOTE: A choropleth map uses increasing intensity of a colour to illustrate the increasing intensity of a particular phenomenon. Sample data could include Prevalence # of cars/telephones per capita, Gross Domestic Product Income per capita, Literacy rates etc.

**Objectives**

**Broad Understanding**

Students will identify and describe patterns and trends that exist given a portion of the data. Then they will speculate and predict expected patterns and trends to other parts of the world.

**Requisite tools**

*Background knowledge*

* Students should be familiar with the construction and interpretation of choropleth maps
* Students should have experience with the concept of anomalies as well as identifying them on choropleth maps

*Criteria for judgment*

* Criteria for speculation
  + - Does it make sense?
    - Is the speculation consistent with the data that has been provided

*Critical thinking vocabulary*

* **Analysis:** Examining the data in detail by breaking it up into its parts to understand the issue more deeply
* **Speculate:** Form a theory or conjecture about a subject without firm evidence

*Thinking strategies*

*Habits of Mind*

**Tolerant of ambiguity:** Is willing to live with ambiguity—doesn’t require black-or-white answers.

**Thinking About Our Thinking:** Is able to reflect on and evaluate the quality of one’s own thinking skills and strategies.

***Suggested Activitives***

**Pre-planning**

* *Determine the data that best supports course content.*
* *For that topic select a global choropleth map which provides relevant data. Secure an electronic copy of the map or a colour transparency of the ma. For example* 
  + Prevalence # of cars/telephones per capita
  + Gross Domestic Product Income per capita
  + Literacy rates
* *As necessary book data projector/overhead*

**Session One**

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| **In this section, students will:** | **Instructions to the teacher** |
| Develop or review thinking strategies for interpreting choropleth maps | Project or distribute a choropleth map of the world that illustrates a single and fairly familiar issue – e.g. GDP per capita or average family income (note: need to select one to use here – simple context).  Indicate that students have a limited amount of time (e.g. 3 minutes) to individually examine the map and write down 3 conclusions:  - 1 conclusion they can draw about a particular country  - 1 conclusion they can draw about a group of countries (their choice of grouping)  - 1 conclusion they can draw about a broader region (e.g. continent, hemisphere, etc.)  Invite them to share their thinking and justify their conclusions with a partner.  Next, invite them to think about their thinking:  - What did they do first when presented with the challenge?  - What did they find themselves doing as they examined the map?  - What did they have difficulty with and why?  Select a few students to share their answers to these questions with the class. During the class discussion, draw out some relevant thinking strategies they have used for interpreting choropleth maps. These might include:   * Start with the title and date of the map to get a sense of the purpose of the map * Look at areas with similar intensity of colour to see if any patterns emerge * Think about what we already know about various regions or countries to see if our conclusions seem to match our prior knowledge * Pick out things which seem to be anomalies to the pattern or that surprise and consider how these might be explained   (note: need a geographer to double check the thinking strategies above!)  Consider posting this criteria on the wall for future reference.  Make connections to previous knowledge about interpreting choropleth maps, and vocabulary relating to the selected sample map. Review mapping conventions as necessary. |
| *Be introduced to the concept of Patterns and Trends* | Suggest to students that identifying and speculating about patterns and trends is one of the key things that geographers do. Indicate that this map was generated from a set of statistics (note: should we show the statistics it was developed from?).  Invite students to talk to a partner about which resource they find it easier to use to identify a pattern – the statistics or the choropleth map and why. Suggest that both resources require different thinking strategies that we can apply to discern a pattern and that once we have practiced and articulated these thinking strategies, not only will it be easier to identify a pattern but we can also speculate about how the pattern might apply to an area that might not be shown on the map or for which there may not be available statistics.  Finally, suggest that once we can articulate the visible pattern, we can also make inferences about what else this might tell us about the countries or regions depicted. |
| *Infer explanations for the pattern and implication of the pattern* | Invite students to return to the map they were examining and work with a partner to infer what the reasons for the pattern might be. Students might hypothesize that countries with very low GDP per capita might be:  - those with few natural resources  - those that have a history of being colonies or exploited by other countries  - those that have a history of war or other de-stabilizing events (e.g. natural disasters)  - those with a particular form of government  - those with a very high population  Suggest that we would need to confirm these inferences by examining other data and that some of these inferences might be more plausible than others.  Next, ask students to think about what the implications of this pattern might be. Sample student answers might include:  - lower than average nutrition since less income might restrict the ability to buy high quality food  - few people able to attend post-secondary institutions unless they are government-funded  Point out that students are moving beyond simply identifying patterns and are beginning to how different patterns might overlap. |

**Session Two**

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| *Apply the thinking strategies to articulate the visible pattern and make inferences about the pattern* | Present students with a choropleth map Provide students with the following map of Physicians per Capita but conceal Africa.  See <http://www.google.ca/imgres?imgurl=http://ucatlas.ucsc.edu/health/physicians/physicians_web.gif&imgrefurl=http://ucatlas.ucsc.edu/health/physicians/physicians.html&usg=__gNY-wUgMjxn58oNiHFYC6K3e7Ac=&h=446&w=576&sz=47&hl=en&start=1&itbs=1&tbnid=E8hRCAj798u88M:&tbnh=104&tbnw=134&prev=/images%3Fq%3Dmap%2BDoctors%2Bper%2Bcapita%26hl%3Den%26gbv%3D2%26tbs%3Disch:1>  Alternatively, you might select a map that fits the context of the unit students are studying. When selecting a map, choose one indicating some sort of global data in a context student may be familiar with (e.g. number of doctors per capita. In addition, ensure that a global pattern will be apparent to students and select which part of the map will be hidden, and which part will be visible. Ensure that the colour variation is easy to read.  Project or distribute the map but conceal a portion of it.  Review map conventions as necessary, drawing attention to the legend, title and date of map. Suggest that it is important to identify patterns and trends using the evidence that is available.  Use a think-pair-share strategy to have students “read the data” and articulate the visible pattern using the thinking strategies above. Then ask them to infer, or conclude based on assumptions why this pattern exists. To guide their thinking, invite them to use BLM#1: What is the Pattern?  Circulate around the class and support any groups that need prompts to deepen their analysis of the map/data.  As students are working, circulate around the room and draw out analysis such as :   * Poor nations have few Doctors per capita * Poor nations are likely to have higher infant mortality * Poor nations likely have less control on simple health issues like diarrhea * Wealthy countries have many Doctors per capita   Invite students to share their inferences with the rest of the class.  ***Opportunity for differentiation:***   * *Map selection can be based on student preference for the topic* * *Map selection can be based on complexity of the topic being mapped* * *Students can work alone in pairs or small groups* * *You may wish to model this task or part of it (e.g. think aloud to complete the 1st row of the graphic organizer).*   **Assessment for learning** Consider assessing students notes on Blackline Master #1 before they proceed to the next step. |
| Apply thinking strategies to speculate on the rest of the pattern | Invite students to speculate on what the concealed part of the map (Africa) would look like.  Look at individual countries/colours and articulate the visible pattern   * What does this pattern imply? * Why does the pattern exist for the portion of the map revealed? * What insight does the map give you into the situation in Africa? * Identify and provide possible explanation for any anomalies?   Based on their answers suggest that they have uncovered criteria for speculation as well as potential anomalies.  Highlight Criteria for Plausible Speculation: Makes sense in the context of our prior knowledge Consistent with rest of data |
| Share results | Ask a few students to share their speculation with the rest of the class.  Discuss as necessary student responses. Reveal the rest of the map so students can assess their predictions. Rather than focusing on whether or not students got the “right” answer, focus on the quality of their thinking and the reasons why their predictions might not match the reality depicted in the map. Were there anomalies they couldn’t have anticipated? Did they need more background knowledge? Was their speculation based on preconceptions that might have been false? |
| *Nurturing self-regulated thinking* | Consider gradually releasing responsibility to students for selecting the thinking strategies that would be most helpful when they interpret and speculate about choropleth maps as the course progresses  Initially, you might require or encourage students to use various thinking strategies they have been introduced to here.  As time progresses and students become more adept at using these thinking strategies, consider moving them toward self-regulated thinking by encouraging them to select which thinking strategies might be most useful when faced with similar challenges. |

**Assessment for learning**

*Assess the first completed BLM prior ro the students completing a second one to ensure the depth of thinkingand understanding.*

**Assessment of learning**

*(If applicable)*

**Resources**

<http://www.google.ca/imgres?imgurl=http://ucatlas.ucsc.edu/health/physicians/physicians_web.gif&imgrefurl=http://ucatlas.ucsc.edu/health/physicians/physicians.html&usg=__gNY-wUgMjxn58oNiHFYC6K3e7Ac=&h=446&w=576&sz=47&hl=en&start=1&itbs=1&tbnid=E8hRCAj798u88M:&tbnh=104&tbnw=134&prev=/images%3Fq%3Dmap%2BDoctors%2Bper%2Bcapita%26hl%3Den%26gbv%3D2%26tbs%3Disch:1>

Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Blackline Master #1

**What is the Pattern?**

**Title/Date of Map:**

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| --- | --- | --- | --- |
|  |  | **Inferences** | |
|  | **Read the data**  Articulate the visible pattern. | What could explain this pattern?  (Why might the pattern exist for the portion of the map revealed?) | What might the implications of this pattern be? (What insight does the map give you into the situation in the country or region?) |
| Areas of high colour intensity |  | Social:  Political:  Economic:  Environmental: | Social:  Political:  Economic:  Environmental: |
| Areas of medium colour intensity |  | Social:  Political:  Economic:  Environmental: | Social:  Political:  Economic:  Environmental: |
| Areas of low colour intensity |  | Social:  Political:  Economic:  Environmental: | Social:  Political:  Economic:  Environmental: |
| Anomalies |  |  |  |
| **Speculate** on the pattern on the concealed part(s) of the map. Does it make sense and is it consistent with rest of data? | | | |

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| Accuracy of speculation and consequent identification of pattern or trend. |

BLM 1: Sample student answers

**Title/Date of Map:**

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|  | **Read the data**  Articulate the visible pattern. | **Inferences**  What could explain this pattern? | Why does the pattern exist for the portion of the map revealed? What insight does the map give you into the situation in the country? |
| High colour intensity | Russia  Europe  North America  Australia | Social: wealthy society that can afford and demands both basic health care and specialized care to be readily available, health society with long life expectancy, low maternal and infant mortality  Political: Provides some sort of universal health care  Economic: Wealthy society that collects taxes to pay for universal health care  Environmental: N/A | |
| Medium colour intensity | Most of South America  China  India | Social: Many people have some health care, but it is not universal: fewer people per capita have access to Doctors, simple medical issues can be controlled but are not always successful in keeping infant and maternal fertility rates low  Political: Government may provide the basic care but not specialized care  Economic: Limited funds available for extensive health care  Environmental: N/A | |
| Low colour intensity | Indonesia | Social: increasing health care issues as access to Doctors is more and more limited.  Political: Governments are struggling to provide essential care , governments may not be stable  Economic: local economy is unstable and possibly stuck in a demographic trap  Environmental: N/A | |
| Anomalies | Cuba |  | |
| **Speculate** on the pattern on the concealed part(s) of the map. Does it make sense and is it consistent with rest of data?  Africa will be mostly the two latest shades indicating limited available health care | | | |

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| Accuracy of speculation and consequent identification of pattern or trend. |